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DESCRIPTION OF THE IMMATURES OF *STYRINGOMYIA NEOCALEDONIAE* ALEXANDER (DIPTERA: TIPULIDAE) AND NOTES ON ITS BIOLOGY

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Abstract.—The immatures of *Styringomyia neocaledoniae* Alexander are described. Information on the habitat of the last larval instar and pupa, and on the resting behavior of the adult is given. Comments on the taxonomic placement of the genus are also given.

Key Words.—Insecta, Diptera, Tupulidae, *Styringomyia neocaledoniae,* habitat, behavior, classification

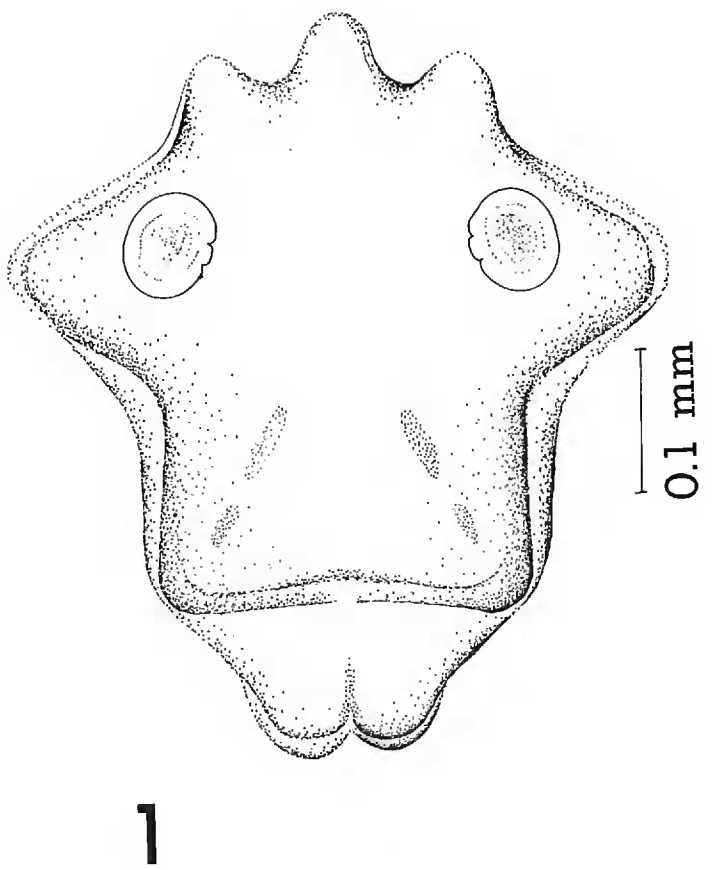
Most of the information about the more than 100 species of *Styringomyia* consists of the original description, location of the holotype and paratypes, and some comparisons to other species. Edwards (1914) considered the group isolated, possibly primitive on the basis of the strange construction of the adult form, and suggested that it should be removed from its original placement in the Antochini but did not indicate its placement upon removal. For this purpose, Alexander (1920) erected a special tribe, the Styringomyini, but later placed it in the Eriopterini as a subtribe, Styringomyaria. I suggested recently that the genus would be better situated in the Eriopteraria (Hynes 1987), based on the presence of the so-called L-shaped cervical plate (Crampton 1925).

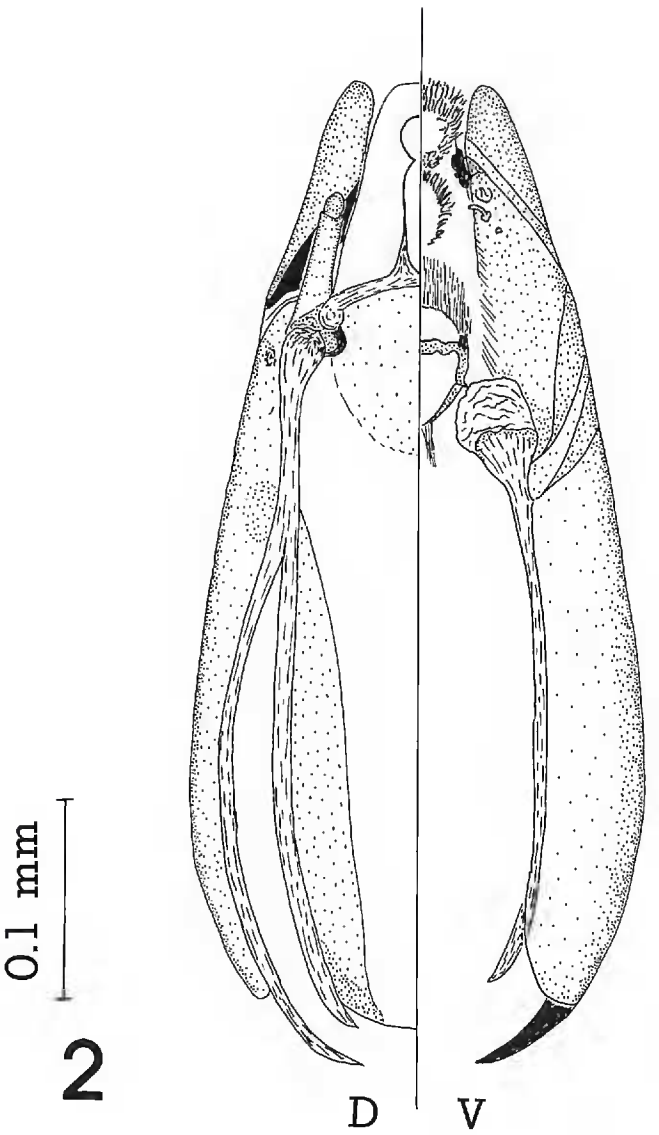
Both Edwards (1914, 1924) and Alexander (1920, 1947) reported observations made by others as to rearing and the habitats of the larvae, as well as peculiar behaviors of the adults. No larval specimens or descriptions accompanied these rearings. Within the Limoniinae, the larval instars give better evidence of relationships than do the adult. The larvae were needed to answer the question of relationships among these genera.

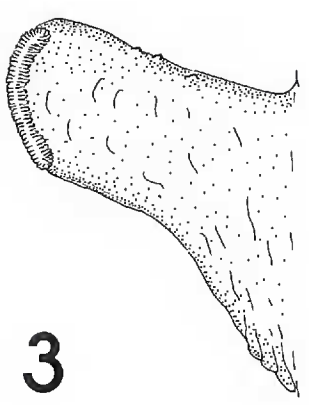
Recently, I was able to collect and rear immature *Styringomyia neocaledoniae* Alexander in New Caledonia, and to gather some preliminary information on their habitats. The following description is based on observations from four larvae and three pupae.

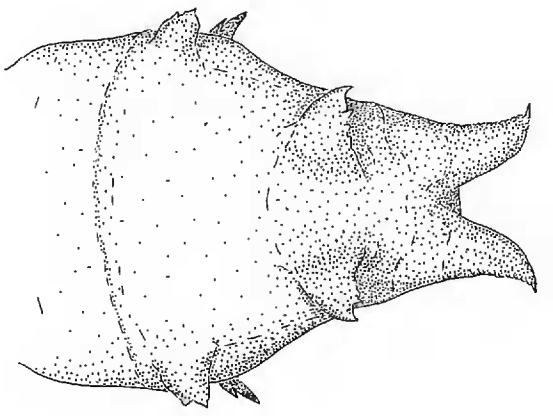
Taxonomy and Biology

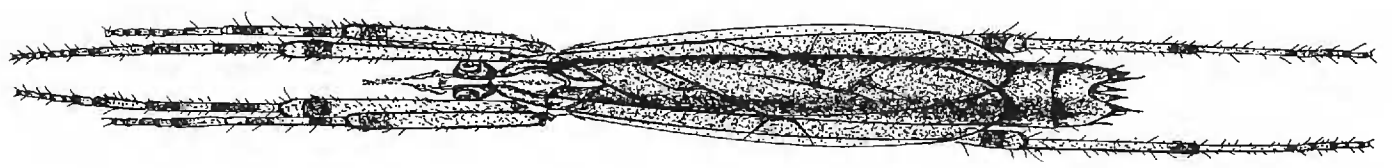
Description.—Larva. Length 7.2 mm; dorsoventral and dextrosinistral measurements at third abdominal segment 0.5 mm. Body white-yellow, cylindrical, becoming slightly smaller at eighth abdominal segment, then abruptly larger at disk. Spiracular disk (Fig. 1) with seven fleshy lobes (three smaller lobes on the dorsal rim, two larger lateral lobes, and two ventrolateral lobes), structured as a rectangular ventral margin of the plate; face slightly convex; white with light brown markings at center of ventrolateral arms. Spiracles with very light rims, darker centers; the medial outer margin with two small invaginations. Head capsule length (tip of labrum to posterior end) 0.48 mm (Fig. 2); width 0.14 mm at mandibular articulation. Labrum with basal plate projecting forward, projections heavily sclerotized, with two ovate rows of setae extending from ventral surface (messores?). Mandible strongly rotated, nearly vertical; six "bars" with membranes between them forming three plates; dorsal and lateral plates membranous, sclerotized areas at junction of dorsal and dorsolateral bars. Maxillary plate not toothed, expanded slightly at anterior end near junction with heavily sclerotized maxillary cardo.











Figures 1–6. *Styringomyia neocaledoniae*. Figure 1. Spiracular disk of larva. Figure 2. Head capsule of larva (D = dorsal, V = ventral). Figure 3. Metathoracic breathing horn. Figure 4. Terminal segments of pupa of male. Figure 5. Adult female at rest. Figure 6. Portion of abdomen of adult male that extends beyond wings while at rest.

Pupa.—Length 4.2 mm; dextrosinistral width at base of wing pad 1.1 mm; dorsoventral width at base of wing pad 1.25 mm. Body yellow-white. Two conspicuous tubercles behind base of antennae each having a long stout seta. Mesonotal breathing horns flattened dorsoventrally, short (0.14 mm), extended laterally and slightly cephalad (Fig. 3). Mesonotum without crest of spines. Wing pads dark in older specimens, end at posterior margin of second abdominal segment. Leg sheaths short, ending at posterior edge of third abdominal segment; sheaths nearly same length but metathoracic slightly shorter, prothoracic pair slightly longer. The posterior edges of abdominal segments sparsely armed with very small spines. Male terminalia (Fig. 4) with eighth sternite possessing a double toothed tubercle at each extreme lateral margin, each with a short, thick seta at tip. Dorsal portion of eighth tergum with a lateral tubercle on each side, armed with one or two short spines. Dorsum of ninth tergum with two pointed, flattened tubercles directed laterad, fleshy serrations on posterior edge. Sheaths of dististyles smooth, conical, directed caudad at base, curving gently laterad to a point, a short thick spine at tip.

Taxonomic Placement.—Data from the larval instars show that both Alexander and Edwards were correct in moving *Styringomyia* from the Antochini to the Eriopterini in that the genera in the former tribe have "massive" head capsules. The larval head capsule of *Styringomyia* is that of typical eriopterine larvae having the six so-called "bars" and slanted mandible. However, the degree of difference between the larvae of *Styringomyia neocaledoniae* and the larvae of other Eriopteraria is no greater than that between the larvae of *Erioptera* and *Molophilus.* There is no evidence that a special tribe or subtribe is necessary to indicate generic relationships. Indeed, the "strange" differences of structuring in the adult stage could just as easily be interpreted as indicating a more specialized condition, rather than primitive as suggested by Edwards (1914). On the basis of the larval data, along with the presence of the L-shaped cervical plate in the adult, *Styringomyia* should be placed in the tribe Eriopterini, subtribe Eriopteraria.

Biology.—The larvae of *Styringomyia neocaledoniae* were found in three different habitats. The first habitat is best described as a gathering of small branches into which leaves from various trees have accumulated, forming a mat of decaying organic material. These accumulations, located on the forest floor, are rather large, attaining lengths of two to three meters and widths of one to two meters. They are very probably formed when heavy rains flood an area causing runoff. Many remain wet or damp for long periods of time. The second habitat is the organic remains old tree trunks, especially the interior sections where large amounts of dark brown organic material form. The material remains damp throughout extended dry periods. The third habitat is at the base or petiole of rotting palm fronds. This habitat resembles the bases of the North American *Yucca whipplei* Torrey, the habitat for *Gnophomyia comstocki* Alexander, in that the rotted material is mainly between the epidermal layers which sandwich the lignified rods between them. The material between the rods is brown and sticky, and remains damp through extended dry periods. This habitat is very protective and serves as a media for many species of eriopterine larvae. Associated with *Styringomyia neocaledoniae* are *Erioptera* (*Meterioptera*) *rhaphidostyla* Alexander, *Elephantomyia* (*Elephantomyia*) *garrigouana* Alexander, and *Toxorhina* (*C.*) *caledonica* Alexander. Larval specimens of as yet unidentified species of *Helius, Molophilus,* and *Amphineurus* were also found. The larvae were not easily collected and had to be washed and literally scrubbed out of the sticky material. The pupae are even more difficult to obtain. They are found in a strong case that is closely appressed to the drier rotting areas. Within rearing cages containing humic materials, the larvae of *S. neocaledoniae* form fine earthen tubes through which they traveled;

this behavior is similar to that of *Limonia.* The tubes are thin, but extend over edges and through the spaces to other large particles of habitat.

The adults walk with short, rapid, and quite erratic movements. Both Edwards (1924) and Alexander (1947) noted the peculiar resting position of adults which reputedly resembles a spider web (Fig. 5). This would infer that the animal is mimicking spiders as a matter of protection. If this infers spider mimicry, however, I found no spiders with even a remote resemblance. If correct, however, the terminal portion of the male sticks out from under the wings looking like a head region from above (Fig. 6)? From this angle the dark dististyles appear as eyes, presenting two possible "heads." Alternatively, however, the dorsal and lateral views give light and dark disruptive patterning. The resting position brings the legs approximately parallel, causing the dark and light bands. The lighter wing areas and the dorsomedial on the thorax and head enhances the disruptive coloration. All other *Styringomyia* possess this coloration. While it is unlikely that all *Styringomyia* mimic the spiders, or have a spider to mimic, all have disruptive coloration.

Alexander (1920) also noted life history information on *Styringomyia didyma* that leads one to the conclusion that it may have the shortest life cycle of any crane-fly species; there may, however, have been no assurance that the media contained no other larvae. His noted hatching period is given as 10–15 days, approximating that of eriopterines generally. My data on *neocaledoniae* indicate that the pupal stage takes 7 days, again normal for eriopterines. There was no indication that *S. neocaledoniae* is multivoltine. I suspect Alexander's media was contaminated with other larvae mature enough to emerge and confuse the noted development time; thus *S. didyma* should be reared again to confirm the information given. If Alexander's information is true, *S. didyma* would be useful as a laboratory species with which to gain information on crane-fly biology.

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